

ABSTRACT

A support electrode (2) and a counter electrode (16) constituting parallel plate electrodes are disposed in a process vessel (1). A substrate (W) with an organic material film formed thereon is supported by the support electrode (2). A high-frequency power of a frequency of 40 MHz or above for generating the plasma is applied to the support electrode (2), so that a high-frequency electric field is formed between the support electrode (2) and the counter electrode (16). A process gas is supplied into the process vessel (1) to generate plasma of the process gas by the high-frequency electric field. The organic material film on the substrate (W) is etched with the plasma, with an organic material film serving as a mask.

The process gas includes an ionization accelerating gas, such as Ar, that is ionized from a ground state or metastable state with an ionization energy of 10 eV or below and has a maximum ionization cross-section of $2 \times 10^{16} \text{ cm}^2$ or above.